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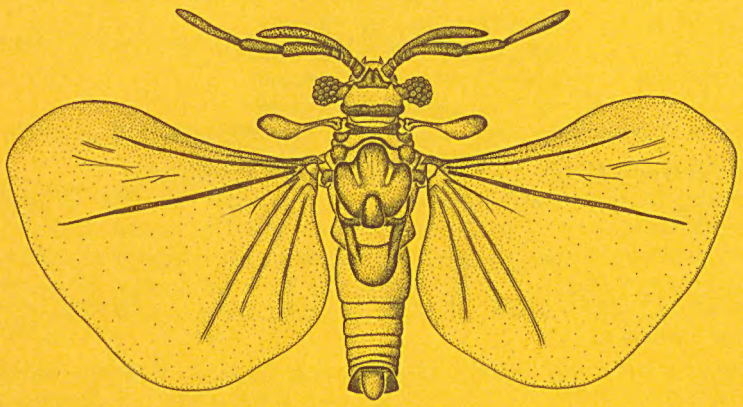

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Cover: Strepsiptera are entomophagous parasitoids which exhibit extreme sexual dimorphism, the males being winged and free-living while the wingless females are permanently endoparasitic in the host. The specimen illustrated belongs to the family Stylopidae and are parasites of Vespidae, Sphecidae and Apoidea. Illustration by Yanni Martin.

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PSOCOPTERA FROM COOCUMBAC ISLAND NATURE RESERVE, TAREE, NEW SOUTH WALES

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Abstract

Seventeen species of Psocoptera are recorded from a floodplain rainforest remnant in Coocumbac Island Nature Reserve. They include one new species, *Ptycta williamsorum* sp. nov. (Psocidae), and the previously unknown male of *Ectopsocus hartleyi* Smithers, which is described.

Introduction

Floodplain, or riverine, rainforest has been extensively cleared in New South Wales, with only about 100 hectares surviving as disjunct remnants (Williams 1993). Although a number of remnants survive in the Manning Region (Williams 1993, 1995; Evans 1993), only that of Coocumbac Island Nature Reserve, Taree, is currently included in the NSW system of nature reserves. Their invertebrate fauna is largely unknown. This paper records 17 species of Psocoptera collected during a faunal survey of that reserve. The survey, part of the Australian Museum's Rainforest Terrestrial Invertebrate Program, was carried out by Geoffrey and Thusnelda Williams. All material examined is deposited in the Australian Museum, Sydney.

Psocoptera from Coocumbac Nature Reserve

ECTOPSOCIDAE

Ectopsocus albiceps Smithers

Material examined. 4 ♂, 24.x.-10.xi.1994; 2 ♂, 1 ♀, 10.xi.1994; 1 ♂, 10-21.xi.1994.

Ectopsocus australis Schmidt & Thornton

Material examined. 1 ♀, 24.x.1994; 3 ♂, 2 ♀, 24.x.-10.xi.1994; 1 ♂, 4 ♀, 10-21.xi.1994; 3 ♂, 4 ♀, 1-7.xii.1994.

Ectopsocus briggsi McLachlan

Material examined. 1 ♂, 24.x.-10.xi.1994.

Ectopsocus hartleyi Smithers

Ectopsocus hartleyi was described on female material only from the Mount Royal area of the Hunter Valley, NSW. The males described here are associated with the females on the basis of the similarity of their general morphology, fore wing venation (Rs and M joined by a crossvein, a condition uncommon in *Ectopsocus*) and distinctive head and wing pattern (Smithers 1997).

Description of male. Coloration (in alcohol) as in female.

Morphology. Length of body 1.6 mm. General morphology and arrangement of setae as in female. Length of flagellar segments: f1 = 0.175 mm; f2 = 0.11 mm. Eyes fairly small for a male of this genus, not reaching level of vertex. IO/D: 2.2; PO: 0.83. Measurements of hind leg: F: 0.31 mm; T: 0.49 mm; t1: 0.19 mm; t2: 0.08 mm; rt: 2.4:1; ct: 14,0. Fore wing length: 1.22 mm; width: 0.48 mm. Venation as in female, with Rs and M joined by a distinct crossvein. Pterostigma a little wider distally than elsewhere. Wing margin from just basal to distal section of Sc to nodulus setose, a double row of setae from distal end of pterostigma to R4+5. Veins, except Cu2, setose, setae stout and dark, as in female. Hind wing as in female, glabrous. Clunial comb of about 45 small, evenly spaced teeth arranged in a straight transverse row. Epiproct simple, with few setae. Paraproct with field of eight large, closely spaced trichobothria and one fine seta without a 'rosette' base, as in female. Hind margin with short, stout cone with a long adjacent seta. Hypandrium simple with transverse hind margin. Phallosome (Fig. 7, slightly distorted in preparation) with distinctive arrangement of sclerites. Two long, distally widening, apically outwardly curved rods flank a median rugose penial bulb. A centrally placed T-shaped sclerite lies above the bulb on each side of which is an elongated, sclerotised plate lying between bulb and lateral rod.

Material examined. 3 ♂, floodplain rainforest remnant, Coocumbac Nature Reserve, Taree, 24.x.-10.xi.1994, G. & T. Williams.

LEPIDOPSOCIDAE

Echmepteryx (Loxopholia) brunnea Smithers

Material examined. 1 ♀, 21-30.xi.1994.

MYOPSOCIDAE

Myopsocus australis (Brauer)

Material examined. 1 ♂, 10.xi.1994.

PERIPSOCIDAE

Peripsocus milleri (Tillyard)

Material examined. 2 ♂, 24.x.-10.xi.1994; 1 ♀, 10-21.xi.1994; 1 ♀, 21-30.xi.1994; 1 ♂, 1-7.xii.1994.

Peripsocus tillyardi New

Material examined. 1 ♀, 10.xi.1994.

PHILOTARSIDAE

Haplophallus sinus Thornton

Material examined. 1 ♀, 24.x.1994; 1 ♂, 1 ♀, 24.x.-10.xi.1994; 1 ♀, 10.xi.1994; 2 ♂, 10-21.xi.1994.

Latrobiella guttatus (Tillyqrd)

Material examined. 2 ♂, 2 ♀, 24.x.-10.xi.1994.

Latrobiella lemsidia (Thornton & New)

Material examined. 1 ♂, 1-7.xii.1994.

Latrobiella paraguttatus (Thornton & New)

Material examined. 1 ♀, 24.x.-10.xi.1994; 2 ♀, 10.xi.1994.

PSEUDOCAECILIIDAE

Austropsocus viridis (Enderlein)

Material examined. 3 ♂, 2 ♀, 24.x.-10.xi.1994; 1 ♂, 10.xi.1994.

Heterocaecilius lachlani (Enderlein)

Material examined. 3 ♂, 1 ♀, 24.x.-10.xi.1994.

Lobocaecilius monicus Lee & Thornton

Material examined. 3 ♂, 2 ♀, 24.x.-10.xi.1994.

Pseudoscottiella papillosa Schmidt & Thornton

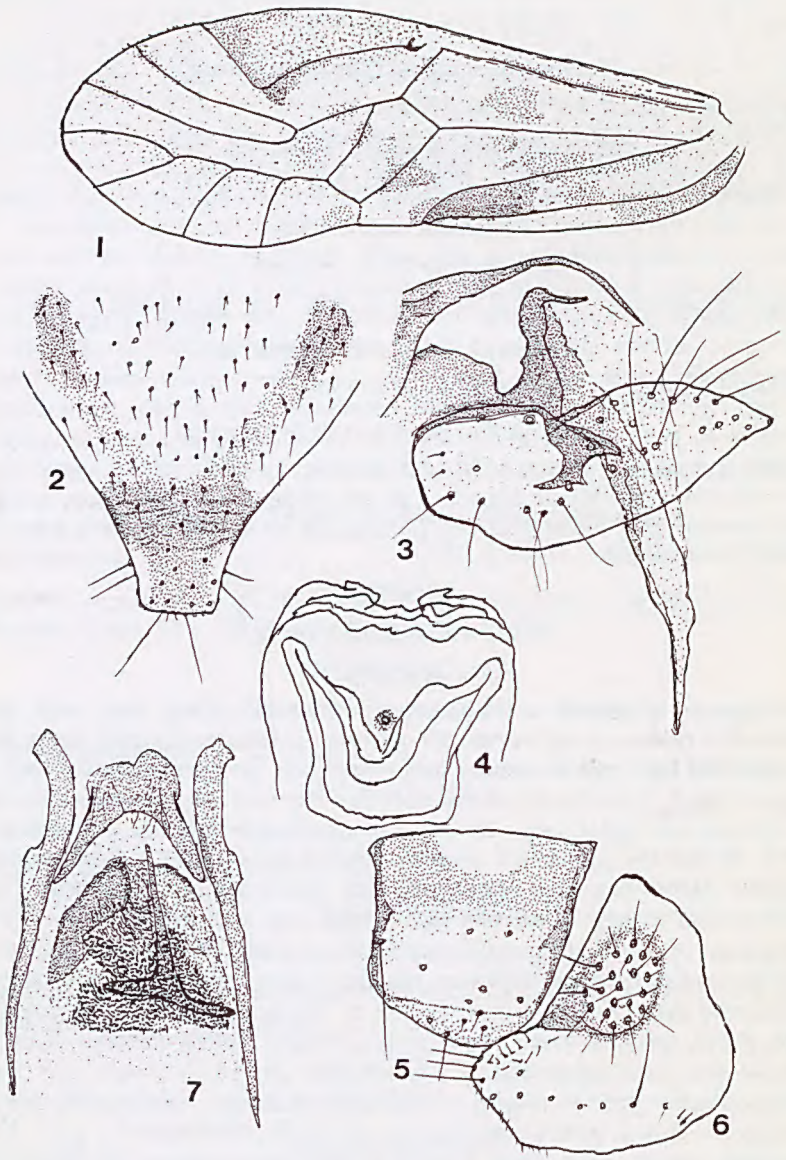
Material examined. 1 ♂, 24.x.1994.

PSOCIDAE

***Ptycta williamsorum* sp. nov.**

(Figs 1-6)

Description of female. Coloration (in alcohol): Head pale with very distinctive pattern in various shades of brown. Median epicranial suture dark in posterior half, pale in anterior half. Head pale grey-brown across back of head, a band of similar colour adjacent to compound eyes and on either side of median epicranial suture so that each epicranial plate has a central pale area. Within the pale area a conspicuous dark brown spot, a similar spot at anterior part of pale area adjacent to each lateral ocellus. Fine brown line from ocellar triangle to antenna base. Frons pale with two divergent brown lines from ocellar triangle to epistomial suture, each line ending in a spot. A similar spot on each side between the above spot and base of antenna near epistomial suture. A line from bottom of eye to epistomial suture passing just above antenna base. Fine brown parallel antero-posterior lines on postclypeus with suggestion of a broad, pale brown, V-shaped pale band from antennae base to middle of clypeolabral suture. Genae pale, labrum mostly so. Scape, pedicel and first and second flagellar segments pale, distal segments brown. Eyes black. Ocellar tubercle black. Meso- and metanotum pale grey-brown with darker sutures, areas on each side just posterior to axillary cord dark brown. Pleura pale, dark brown just below wing bases. Coxae pale, dark basally. Femora pale with narrow brown band just basad of joint with tibia. Tibiae pale. Both tarsal segments of prothoracic legs brown.



Figs 1-7. 1-6: *Ptycta williamsorum* sp. nov., female: 1, fore wing; 2, subgenital plate; 3, gonapophyses; 4, entrance to spermatheca; 5, epiproct; 6, paraproct. 7: *Ectopsocus hartleyi*, male phallosome.

Mesothoracic legs with basal tarsal segment pale, distal segment dark. Metathoracic tarsus similar but with a short dark brown section at distal end of basal segment. Fore wings (Fig. 1) hyaline with pattern in various shades of brown. Hind wing hyaline with small faint brown area at ends of veins R2+3 and R4+5. Abdomen pale dorsally and dorsolaterally with three broad longitudinal bands made up of irregular patches on each segment.

Morphology: Length of body 3.9 mm. Median epicranial suture distinct, anterior arms evanescent. Vertex transverse between compound eyes. Head, including genae, lightly setose. Length of flagellar segments: f1: 0.81 mm; f2: 0.70 mm. Antennae strongly setose, most setae of first two flagellar segments about as long as flegellar diameter. Eyes large, just reaching level of vertex, emarginate opposite base of antenna. IO/D: 1.5; PO: 0.92. Measurements of hind leg: F: 0.81 mm; T: 1.75 mm; t1: 0.54 mm; t2: 0.14 mm; rt: 4:1; ct: 24,2. Combs of ctenidiobothria strongly developed and well sclerotised. Fore wing (Fig. 1) margin with a few short setae between end of pterostigma and wing apex. Basal section of Sc, weakly developed, ends free in costal cell. Pterostigma concave proximal to hind angle. No spurvein. Rs and M fused for a length. Cu1 straight where it forms proximal margin of discoidal cell. M slightly curved to give a concave distal margin to cell. Basal section of Cu1a about equal in length to second and at a slight angle to it. Hind wing with Rs and M fused for a short length. A few setae on wing margin between R2+3 and R4+5, these veins a little thicker than stem of Rs fork. Epiproct (Fig. 5). Paraproct (Fig. 6). Subgenital plate (Fig. 2). Entrance to spermatheca (Fig. 4) surrounded by characteristic, lightly sclerotised folds of integument. Gonapophyses (Fig. 3) with small ventral valve, broad transversely ovoid, external valve.

Male. Unknown.

Material examined. NEW SOUTH WALES: Holotype ♀, floodplain rainforest remnant, Coocumbac Nature Reserve, Taree, 10-21.xii.1994, G. & T. Williams (in Australian Museum, Sydney).

Discussion. The females of several Australian species of *Ptycta* have a pigmented area adjacent to fore wing vein M+Cu1 in addition to other pigmented areas. In most species this patch lies behind M+Cu1 in the angle formed by Cu1 and its separation from M. In three previously described species this patch is remote from the angle and lies nearer to the wing base, as it does in *P. williamsorum*. The other species with this wing feature are *P. campbelli* Schmidt & Thornton, *P. emerginata* New and *P. umbrata* New. They are indistinguishable from one another on this feature. *P. emarginata* can be distinguished from *P. williamsorum* in having Rs and M meeting in a point. In *P. williamsorum* the patch of brown in the angle at the nodulus is much more extensive than in *P. campbelli,* occupying about the distal third of cell Cu2. In *P. umbrata* there are two patches of brown in cell R, whereas in *P. williamsorum* there is only one. The female genitalia of all four species

are similar to one another, especially in having an exceptionally small ventral valve and in the transversely elongate-ovoid shape of the setose external valve.

Acknowledgments

I would like to thank Geoffrey and Thusnelda Williams for making their material available for study.

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PHYTOPHAGOUS INSECT FAUNA OF TWO WEEDS, *HYPTIS SUAVEOLENS* (L.) POIT. AND *JATROPHA GOSSYPIFOLIA* L., IN AUSTRALIA'S NORTHERN TERRITORY

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Abstract

The phytophagous insect fauna of the exotic weeds *Hyptis suaveolens* (L.) Poit. (Lamiaceae) and *Jatropha gossypifolia* L. (Euphorbiaceae) are recorded for the Northern Territory, Australia. Six species were found feeding on *H. suaveolens* and one on *J. gossypifolia.* Both plant species have been colonised by far fewer insects than other exotic weeds of similar size, geographic range and time since introduction.

Introduction

Hyptis suaveolens (L.) Poit. (Lamiaceae) and *Jatropha gossypifolia* L. (Euphorbiaceae) are plants of tropical American origin now widespread in northern Australia (Parsons and Cuthbertson 1992). *H. suaveolens,* an erect, annual, woody-based herb with a strong aromatic smell, was reported in Australia at Port Essington on the north coast by the explorer and botanist Ludwig Leichhardt in 1845 (Bentham 1870). *J. gossypifolia*, a perennial, woody subshrub, was probably introduced deliberately to northern Australia some time last century as an ornamental or medicinal plant (Pitt and Miller, in press). Its features include thick, soft, sappy stems, glossy green or reddish-purple leaves divided into three or five lobes and the presence of numerous branched, sticky, glandular hairs on leaf margins and petioles.

Although morphologically and taxonomically distinct, both species have been used to treat a wide variety of ailments and conditions in traditional medicine throughout the world, from the common cold to cancer (Chopra *et al.* 1956; Irvine 1961; Morton 1981; Schultes 1987; Uphof 1968).

Of greater interest to this study, however, is that both species have reputed insecticidal properties. Pittier (1942) suggested that *H. suaveolens* might have some use as an insecticide and extracts of the plant have since been found to kill mosquito larvae (Sharma *et al.* 1992) and mites (Cervancia and Aspiras 1987). Branches of *H. suaveolens* are used under beds and chairs to deter bedbugs in the Philippines (Uphof 1968) and Timor (I. Wayan Mudita, personal communication). Prasad *et al.* (1993) referred to insecticidal properties of *J. gossypifolia*, and Chatterjee *et al.* (1980) found that the seeds contained toxic principles that acted as contact insecticides. According to Raina and Gaikwad (1987), infestations of *J. gossypifolia* in India are completely free of any visible fungal or insect damage.

H. suaveolens has been a candidate for biological control in the Northern Territory since 1979 and natural enemies with potential for use in such a project have been found in tropical America (I. W. Forno, personal communication) although their host range has not been studied. *J. gossypifolia* is a potential target for a biological control project in northern Australia and Indonesia. As part of the preliminary studies on these weeds in

Australia prior to introduction of agents for biological control, their acquired phytophagous insect faunas were identified. The results of these studies are reported here.

Materials and Methods

Between 1984 and 1987, immature and mature phytophagous insects were handpicked or aspirated from seedlings and mature plants of *H. suaveolens* and *J. gossypifolia* whenever they were found. Flowers, fruit, leaves, stems and roots were all examined carefully for signs of insect herbivory. Damage was correlated wherever possible to the species and stages of insects present. Only insects which fed on living tissues of the plants in question were included in the phytophagous insect faunas. Insects resting but not feeding on the plant species were not included. Immature insects were reared on excised plant material in the laboratory and adults determined.

H. suaveolens is probably the most widespread and abundant exotic plant in the monsoonal regions of the Northern Territory, and plants were searched opportunistically on more than one hundred occasions during daylight hours and in every month of the year, but more often between December and April when most rain occurs. Areas near Darwin were searched more frequently, but the search area extended from the Calvert River near the Queensland border to the Victoria River near the Western Australian border. *J. gossypifolia* plants were searched on five occasions at Tipperary Station, 150 km south of Darwin, on three occasions at Willeroo Station, 125 km south west of Katherine, and once at Daly Waters. At least 1 h was spent collecting on each occasion.

Results

Hyptis suaveolens

A total of six species of phytophagous insects, representing two orders and five families, was found feeding on *H. suaveolens* in the Northern Territory (Table 1). Only one, the major agricultural pest species *Helicoverpa armigera* Hübner (Zalucki *et al.* 1986), was common. All fed externally on the plant and nymphs or larvae of four species were collected on the plant and reared. Four of the insects are polyphagous, feeding on plants in more than one family. No seed-, flower- or root-feeding species were found.

A parasitoid, *Goniophthalmus* sp. (Diptera: Tachinidae), was reared on several occasions from pupae of *H. armigera*.

Jatropha gossypifolia

Only one species of phytophagous insect was found feeding on *J. gossypifolia* in the Northern Territory, the leaf-mining gracillariid moth *Epicephala* sp. (Table 1). It was collected on each search of plants at Tipperary and Willeroo Stations.

Table 1. Phytophagous insects associated with *Hyptis suaveolens* and *Jatropha gossypifolia* in the Northern Territory.

Insect	Host plant[a]	Stages collected[b]	Associated plant parts[c]	Host relationship[d]	Host specificity[e]
HEMIPTERA					
Dictyopharidae					
Dictyophara australiaca (Lallemand)	H	A	St	ECT	?
Lygaeidae					
Graptostethus pubescens Slater	H	A	Fr	ECT	P
Pentatomidae					
Spermatodes australis (Schouteden)	H	A, N	St	ECT	P
LEPIDOPTERA					
Gracillariidae					
Epicephala sp.	J	L, P	Le	END	?
Noctuidae					
Earias smaragdina Butler	H	L	Le	ECT	P
Helicoverpa armigera (Hübner)	H	L	Fr , Le	ECT	P, E
Pyralidae					
'Pyrausta' phoenicalis (Hübner)	H	L	Le	ECT	?

(a) H, *Hyptis suaveolens*; J, *Jatropha gossypifolia.*

(b) L, larva; N, nymph; P, pupa; A, adult.

(c) Fr, fruit; Le, leaf; St, stem.

(d) ECT, ectophagous; END, endophagous.

(e) P, polyphagous, known from other plant families; ?, host range not known; E, economic pest.

Elasmus formosus Girault (Hymenoptera: Elasmidae) was reared on several occasions as a larval ectoparasitoid of *Epicephala* sp.

Discussion

When a plant species invades a new geographic region, it draws colonists rapidly and asymptotically from the local pool of endemic insects (Strong 1974; Strong *et al.* 1977). The number of insect species which utilise the exotic weed will normally be determined by the presence of related native plant species (Connor *et al.* 1980; McCoy and Rey 1983), the architectural complexity of the plant (Lawton and Schroeder 1977; Strong and Levin 1979), and by the geographic area occupied (Connor and McCoy 1979).

Both *H. suaveolens* and *J. gossypifolia* are in families well represented in northern Australia. The range of *H. suaveolens* in the Northern Territory overlaps that of at least seven genera of native plants in the same family (Lamiaceae), while *J. gossypifolia* overlaps with dozens of genera and species of Euphorbiaceae (Dunlop 1987). *H. suaveolens* is abundant across northern Australia with a local history extending back at least 150 years. *J. gossypifolia* was planted as an ornamental around many Station homesteads

last century, but is abundant at only a few locations in the Northern Territory, including a single stand of over 700 ha on Willeroo Station (Pitt and Miller, in press).

Given the presence of many related native plant species within the ranges of these weeds in Australia, their widespread distributions and relative abundances, their architectural complexity offering many feeding sites, and the length of time available for recruitment of colonists, these two species are remarkable for the absence of diverse phytophagous insect faunas. This becomes even more apparent when one compares them with other exotic weeds in the Northern Territory.

Sida acuta Burm. f. and *S. cordifolia* L. (Malvaceae), two weeds of tropical American origin with similar morphology, distribution and phenology to *H. suaveolens*, have 20 and 23 insect colonists recorded respectively in the Northern Territory (Wilson and Flanagan 1990) compared to *H. suaveolens* with only six, one of which, *Helicoverpa armigera*, is extremely polyphagous, having been recorded feeding on 75 plant species in 29 families (Zalucki *et al.* 1986), nearly all of them exotic. Another, *'Pyrausta' phoenicalis* (Hübner), was also recorded as a natural enemy of *H. suaveolens* in Mexico (J. D. Gillett, personal communication), and hence may itself be an immigrant to Australia.

Xanthium occidentale Bertoloni (Asteraceae), a North American plant species known in Australia as Noogoora burr, is an annual shrub similar in size and structure to *J. gossypifolia*. It is probably more widely distributed in the Northern Territory than *J. gossypifolia* but is an annual species. *X. occidentale* has accumulated 50 species of phytophagous insects (Wilson and Flanagan 1993) compared to just one found on *J. gossypifolia*.

H. suaveolens and *J. gossypifolia* are barely utilised by native phytophagous insects in Australia despite ample opportunity for their recruitment. It appears that the lack of phytophagous insects on these weeds cannot be explained solely in terms of architectural complexity and geographic area occupied. Other similar introduced weeds with these factors in common have accumulated far more insect colonists over a similar time span than *H. suaveolens* and *J. gossypifolia*. I suggest there is some substance to reports that both plant species have insecticidal properties.

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Insect identifications were provided by M. J. Fletcher (Auchenorrhyncha), D. H. Colless (Diptera), G. F. Gross (Heteroptera), I. D. Naumann (Hymenoptera) and E. D. Edwards (Lepidoptera).

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NEW HOST / PARASITOID RECORDS FOR AUSTRALIAN PENTATOMIDAE, TACHINIDAE AND BRACONIDAE

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Abstract

New host / parasitoid records are provided for five species of Pentatomidae (host), seven species of Tachinidae and one species of Braconidae (parasitoids). Tachinids of the genera *Alophora* Robineau-Desvoidy, *Cylindromyia* Meigen and *Pentatomophaga* de Meijere (all Phasiinae), an undetermined genus of Tachininae and a species of the euphorine braconid genus *Aridelus* Marshall, are recorded from the pentatomids *Piezodorous hybneri* (Gmelin), *Dictyotis caenosus* (Westwood), *Plautia affinis* Dallas, *Cuspicona simplex* Walker and *C. forticornis* Breddin.

Introduction

Plant feeding bugs of the family Pentatomidae include economically important pests attacking a wide range of horticultural and agricultural crops. The introduced green vegetable bug *Nezara viridula* (L.) and native species such as *Piezodorous hybneri* (Gmelin), *Plautia affinis* Dallas and *Cuspicona simplex* Walker, attack various fruit, vegetable and legume crops causing fruit drop, distortion and wilting (Gross 1975, Miller *et al.* 1977, Clarke 1992). Records of natural enemies attacking these and other species in Australia are largely restricted to hymenopteran egg parasitoids (Boucek 1988, Johnson 1991). There are no prior records of parasitoids completing development in the damaging nymphal stages and few records of development in the adult stage of Australian pentatomid bugs.

Materials and methods

A survey of nymphal and adult parasitoids of Pentatomidae was conducted at sites in south-eastern Queensland (Brookfield, Indooroopilly and Caboolture) and northern New South Wales (Biniguy) during 1994-1996. Host / parasitoid records were compiled for seven species of Tachinidae and one species of Braconidae recovered from five species of Pentatomidae (Table 1). Where species determinations were not possible, accession numbers were assigned (LPL) and specimens lodged with the CSIRO Long Pocket Laboratories, Brisbane.

Results

Four tachinid species were recovered from *P. affinis*, two each from *P. hybneri* and *C. simplex* and one each from *D. caenosus* (Westwood) and *C. forticornis* Breddin (Table 1). All tachinids were recovered from adult hosts except LPL 9438, which was also recovered from late instar nymphs of *P. affinis*. The braconid *Aridelus* sp. (Euphorinae: LPL 9436), was recovered from 5th instar nymphs of *P. affinis* and *C. simplex*. Collection of several thousand *N. viridula* nymphs and adults recovered no parasitoids.

Table 1. New pentatomid / parasitoid records.

Pentatomid host	Parasitoid	Host plant	Locality
	TACHINIDAE		
Cuspicona forticornis	*Alophora* sp. (LPL 9445)	*Solanum mauritianum* Scop. (wild tobacco)	Brookfield
Cuspicona simplex	Tachininae (LPL 9438)	*S. mauritianum*	Brookfield
	Alophora sp. (LPL 9445)	*S. mauritianum*	Brookfield
Dictyotus caenosus	*Cylindromyia bimacula* (Walker)	*Medicago sativa* (L.) (lucerne)	Biniguy
Piezodorous hybneri	*Alophora* sp. (LPL 9417)	*M. sativa*	Biniguy
	Cylindromyia rufufemur Paramanov*	*M. sativa*	Biniguy
Plautia affinis	Tachininae (LPL 9438)	*S. mauritianum*	Indooroopilly
	Alophora sp. (LPL 9445)	*S. mauritianum*	Brookfield
	Alophora sp. (LPL 9463)	*Ricinus communis* L. (castor oil)	Biniguy
	Pentatomophaga bicincta de Meijere	*Rubus idaeus* L. (raspberry)	Caboolture
	BRACONIDAE		
Plautia affinis	*Aridelus* sp. (LPL 9436)	*S. mauritianum*	Brookfield
		R. idaeus	Caboolture
Cuspicona simplex	*Aridelus* sp. (LPL 9436)	*S. mauritianum*	Brookfield

* Also recorded by Cantrell (1984, 1986).

Discussion

Tachinidae are an important group of parasitoids, having been used extensively as biological control agents (see review by Grenier 1988). Previously, host records were available for only one Australian species attacking Pentatomidae (Cantrell 1984, 1986), that of *Cylindromyia rufifemur* Paramonov, completing development in *N. viridula* and *P. hybneri.* In addition, two species of American origin, *Trichopoda pennipes* (F.) and *T. pilipes* (F.) were introduced to Australia for the control of *N. viridula* during the period 1940-1950 and again during the early 1980's but both apparently failed to establish (Waterhouse and Norris 1987). Parasitism of hemipterous insects by Tachinidae was previously thought to be restricted to members of

the subfamily Phasiinae (Arnaud 1978, Cantrell 1984, 1986; Belshaw 1993). Recovery of species LPL 9438 (subfamily Tachininae) represents the first record of a species outside of the Phasiinae completing development in an hemipterous insect. The placement of this species remains uncertain, but it is tentatively assigned to the tribe Leskiini. As currently constituted, the Australian Leskiini are undoubtedly polyphyletic and this is reflected in the variety of recorded host associations. The addition of a taxon parasitic in Hemiptera further confuses the tribal identity. Additional specimens of LPL 9438, in the collection of the Queensland Department of Primary Industries, were collected from 'hilltopping' localities in central New South Wales and south-eastern Queensland. A preliminary examination of the male and female terminalia reveals an unusual combination of characters which does not clarify the phylogenetic position of this interesting fly (B. K. Cantrell, *pers. comm.*).

Recorded hosts for Australian Euphorinae include certain species of Lepidoptera, Coleoptera and Orthoptera (Naumann 1991), with no previous records of development in hemipterous hosts. However, Loan (1983) recorded three species of *Aridelus* Marshall parasitising early instar pentatomid nymphs in the Neartic region, with mortality of the host occurring in the late nymph and adult stages.

Acknowledgments

Drs Bryan Cantrell (Tachinidae) and Andy Austin (Braconidae) are thanked for taxonomic identifications. Bryan Cantrell is further thanked for comments on the tribal placement of species LPL 9438 within the Tachinidae. Mr and Mrs J. Bowley (Caboolture) are kindly thanked for permission to collect insects from their property. This work was supported by grants from the Horticultural Research and Development Corporation, the Australian Centre for International Agricultural Research and Stahmann Farms Inc.

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THE SPECIFIC STATUS OF *PHILIRIS SAPPHEIRA* SANDS (LEPIDOPTERA: LYCAENIDAE), WITH DESCRIPTION OF A NEW SUBSPECIES FROM AUSTRALIA

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Abstract

The identity of *Philiris sappheira* Sands, previously considered to be a subspecies of *P. nitens* (Grose-Smith), is defined and the species recognised from Australia for the first time. *Philiris sappheira manskiei* subsp. nov. is described from northern Queensland. The larval food plant is *Macaranga involucrata* (Euphorbiaceae).

Introduction

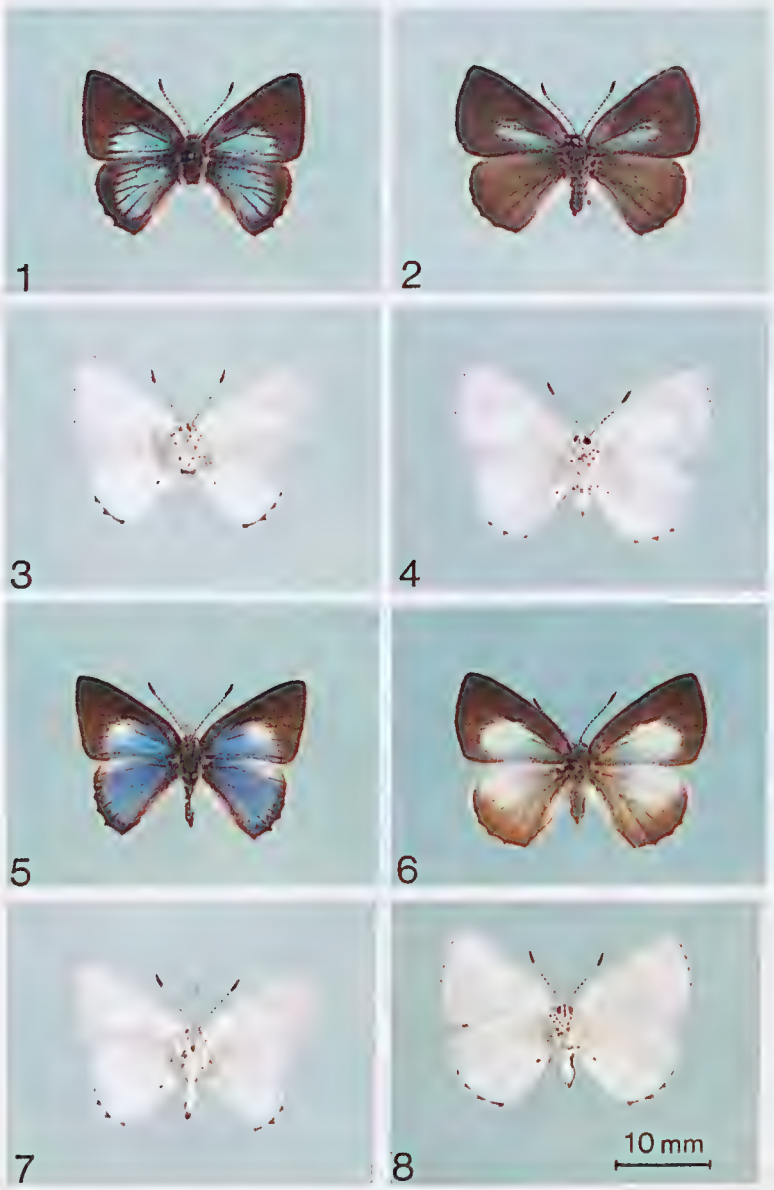
Sands and Fenner (1978) examined four males and a female of an undescribed species of *Philiris* Röber, believed to be a subspecies of *P. nitens* (Grose-Smith), from Central Province, Papua New Guinea and found the male genitalia to be similar to those of *P. nitens lucina* Waterhouse & Lyell. The valvae were reported to be similar to those of *P. n. lucina* but shorter than typical *P. n. nitens.* The female, indistinguishable from that sex of typical *P. nitens* and captured 25 years earlier (Sands 1980), was placed in this taxon on the basis of proximity to place of capture of the males and the apparent relationship of the female to typical *P. nitens*, based on adult morphology. Sands (1980) later described these adults as *Philiris nitens sappheira* Sands. However, the identity of *P. n. sappheira* and its validity as a subspecies of *P. nitens* has been the subject of some doubt, following the location of an isolated colony of a distinctive blue *Philiris* (Figs 1-4) 40 km NW of Cooktown, northern Queensland, first discovered by Mr John Booy who collected a single male in January 1982.

Whilst apparently a close relative of *P. nitens* (Figs 5-8), significant structural differences of the male genitalia (Figs 9-17), together with the distinctive wing pattern of the male upperside, suggest that the taxon *P.n. sappheira* deserves elevation to species level.

Philiris sappheira sappheira Sands, stat. rev.

Philiris nitens ssp., Sands and Fenner, 1978: 107.
Philiris nitens sappheira Sands, 1980: 82, 83.

Types. PAPUA NEW GUINEA: *Holotype* ♂ (ANIC Type Reg. No. 3297, genitalia slide M511), Rouna Falls, Central Prov., 28.vi.1975, 550 m, D.P. Sands. *Paratypes*: 1 ♀, Subitana (Central District), 1800 ft. 15.ix.1949, collected by Wm. Brandt, E.J.L. Hallstrom; 1 ♂, Kokoda Trl, Cent. Prov., 10.i.1977, R. Straatman (all in Australian National Insect Collection, Canberra); 2 ♂♂, Central Dist., Rouna, 400 m., T. Fenner, 21.iv.1974 and 6.ii.1974 (in Central Reference Collection, Department of Primary Industry, Konedobu, Papua New Guinea).



Figs 1-8. *Philiris* spp.; males odd numbers, females even numbers; upperside and underside: (1-4) *Philiris sappheira manskiei* holotype male, paratype female; (5-8) *Philiris nitens nitens*.

Philiris sappheira manskiei subsp. nov.

(Figs 1-4, 9-10, 15)

Types. QUEENSLAND: *Holotype* ♂ (ANIC Type Reg. No. 3330, genitalia slide No. 3438), McIvor River Road, 11.v.1994, L.R. Ring (in ANIC). *Paratypes* (92 ♂♂, 63 ♀♀): 17 ♂♂, McIvor River Road, 1.viii.1993, 12.viii.1993, 14.viii.1993, 20.viii.1993, 22.viii.1993, 26.viii.1993, 4.iv.1994, 28.iv.1994, 1.v.1994, 2.v.1994, 6.v.1994, 9.v.1994, 11.v.1994, 12.v.1994, L.R. Ring; 7 ♀♀, McIvor River Road, 26.viii.1993, 11.v.1994, 25.v.1994, 30.v.1994, L.R. Ring; 1 ♂, 8 km SW Mt Webb, 14.iv.1994, L.R. Ring; 2 ♀♀, 8 km SW Mt Webb, 10.iv.1994, 1.vi.1994, L.R. Ring; 1 ♂, Hopevale Mission, 5.v.1994, L.R. Ring; 8 ♂♂, McIvor River, Cooktown, 25.v.1992, 8.vi.1992, 10.vi.1992, 19.vi.1992, 25.x.1992, 4.vii.1993, L.R. Ring; 11 ♀♀, McIvor River, 24.v.1992, 25.v.1992, 27.v.1992, 2.vi.1992, 8.vi.1992, 10.vi.1992, 12.vi.1992, 15.vi.1992, 17.vi.1992, 19.vi.1992, L.R. Ring; 2 ♂♂, McIvor Station, 27.iv.1994, 28.iv.1994, L.R. Ring; 4 ♀♀, McIvor Station, 14.iv.1994, 25.iv.1994, 1.v.1994, 3.v.1994, L.R. Ring; 1 ♂, 2 km Cooktown side, Endeavour Falls Roadhouse, 3.v.1994, L.R. Ring; 1 ♂, Isabella Falls, 2.x.1991, L.R. Ring; 1 ♀, 1.8 km past junction Battle Camp Road, 2.vi.1994, L.R. Ring (all in ANIC); 8 ♂♂, Isabella Falls, 3.x.1991, 10.xi.1991, 8.iv.1992, 22.iv.1992, 24.v.1992, 28.v.1992, 31.v.1992, J. Olive; 10 ♀♀, Isabella Falls, 14.iv.1992, 22.iv.1992, 23.iv.1992, 26.iv.1992, 28.iv.1992, 29.iv.1992, 3.v.1992, 6.v.1992, 14.v.1992, 18.v.1992, J. Olive; (in J.C. Olive collection); 1 ♂, Isabella Falls, 24.v.1992, J.C. Olive (in Australian Museum, Sydney); 1 ♂, Jan 1982, Cooktown, J. Booy (in J. Booy collection); 3 ♂♂, 24.v.1985, Isabella Falls, R.C. Manskie; 3 ♂♂, 4km W of Isabella Falls, Cooktown, 24.ix.1991, R.C. Manskie (in R.C. Manskie collection); 3 ♂♂, McIvor R. Road, 43 km NW of Cooktown, 22.ix.1993, J.W.C. d'Apice (in J.W.C. d'Apice collection); 5 ♂♂, 4 km NW Isabella Falls, Cooktown, emerged 2.iv.1994, 27.vii.1994, 10.viii.1994, 18.viii.1994, P.S. Valentine; 6 ♀♀, 4 km NW Isabella Falls, Cooktown, emerged 17.v.1994, 18.v.1994, 22.v.1994, 10.vii.1994, 16.ix.1994, 23.ix.1994 P.S. Valentine; 2 ♂♂, Carrol Creek, 3 km NW of Hopevale, emerged 19.xii.1994, 26.xii.1994, P.S. Valentine; 1 ♂, McIvor River, 20 km N of Hopevale, emerged 28.xii.1994, P.S. Valentine; 2 ♀♀, McIvor River, 20 km N of Hopevale, emerged 28.xii.1994, 30.xii.1994, P.S. Valentine; (in P.S. Valentine collection); 1 ♀, McIvor River, 24.v.1992, L.R. Ring; 9 ♂♂, 40 km W of Cooktown, 15°17'S 144°59'E, emerged 6.iii.1993, 5.ii.1994, 9.ii.1994, 12.iii.1994, 15.vii.1994, 19.viii.1994, 9-11.xii.1994, 19-23.v.1995, S.J. Johnson; 8 ♀♀, 40 km W of Cooktown, emerged 10.ii.1994, 15.ii.1994, 21.ii.1994, 27.ii.1994, 6.iii.1994, 27.ix.1994, 9-11.xii.1994, 19-23.v.1995, S.J. Johnson; (in S.J. Johnson collection); 1 ♂, 8 km SW Mt Webb, 6.vi.1994, L.R. Ring; 1 ♀, McIvor Station, 13.vi.1994, L.R. Ring; 14 ♂♂, McIvor River Road, 7.ix.1993, 12.ix.1993, 3.i.1994, 18.i.1994, 4.xii.1995, 7.xii.1995, 18.xii.1995, 20.xii.1995, R.G. Eastwood; 6 ♀♀, McIvor River Road, 13.ix.1993, 23.i.1994, 5.xii.1995, 7.xii.1995, 6.ii.1996, R.G. Eastwood; (in R.G. Eastwood collection); 1 ♂, McIvor River Road, 7.ix.1993, R.G. Eastwood (in L. Matthews collection); 1 ♂, McIvor River Road, 6.ii.1996, R.G. Eastwood (in R.W. Hay collection); 1 ♂, McIvor River, 25.v.1992, L.R. Ring; 1 ♀, McIvor River Road, 1.viii.1993, L.R. Ring (in S. Brown collection); 7 ♂♂, Cedar Scrub, 22.iv.1992, 1.x.1993, 12.x.1993, 15.x.1993, C. Pratt; 3 ♀♀, Cedar Scrub, 31.viii.1993, 28.x.1993, C. Pratt; (in C. Pratt collection).

Male (Figs 1, 3). Antennal length (of holotype) 7.0 mm, shaft dull black with white segmental bands, club dull black with underside orange-brown; head grey, frons adjacent to eye margins white, palpus white, terminal segment and dorsal surface dull black; thorax and abdomen dark grey, ventrally white; legs white, tibiae and tarsi with black bands. Fore wing length (of holotype) 13.0 mm, costa almost straight, termen slightly bowed, colour above grey-black, a basal area not reaching discocellular vein and extending three quarters length of hind margin bright metallic blue-green. Hind wing termen rounded, colour above grey-black, basal half bright metallic blue-green, costa and inner margin greyish. Fore wing beneath silver-white, basal dark suffusion between CuA_2 and 1A+2A. Hind wing beneath silver-white, a narrow black terminal line from M_3 to tornus and black submedian spot on inner margin. Cilia white, at ends of veins M_3, CuA_1, CuA_2 and tornus black .

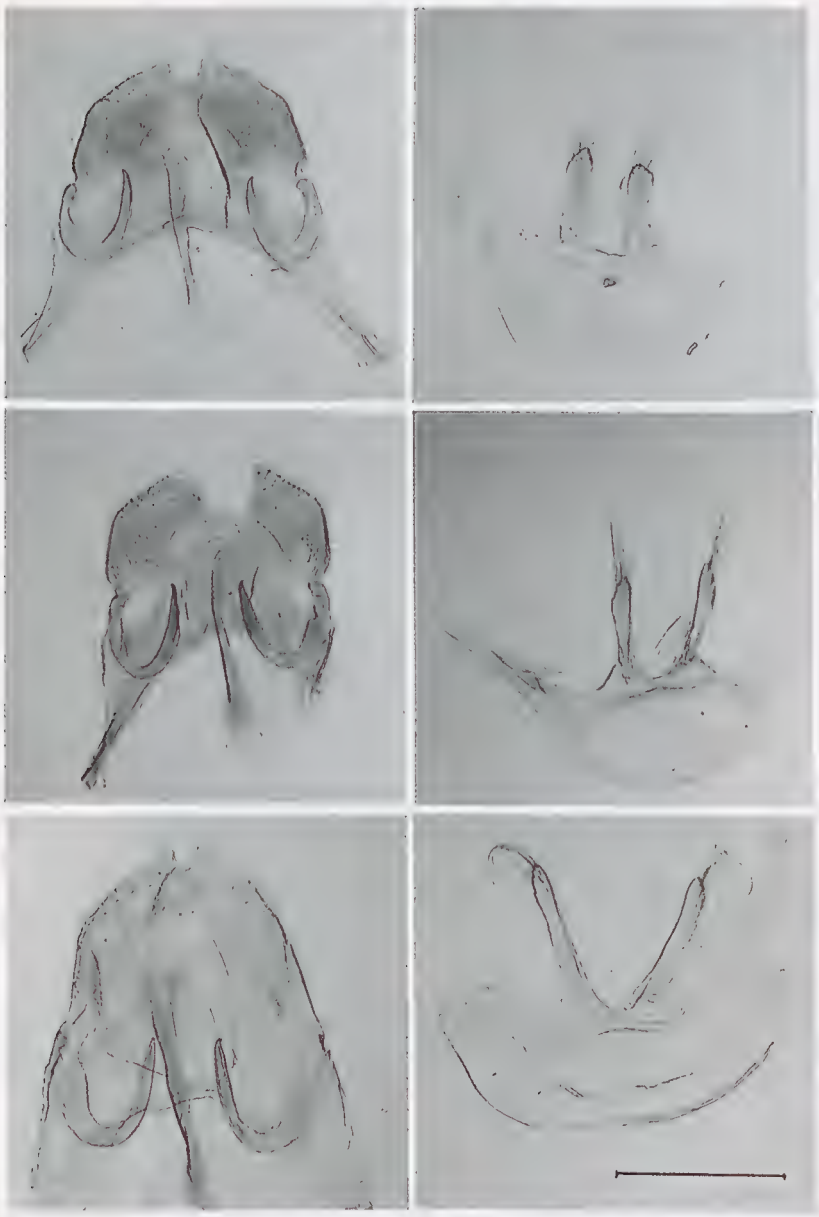
Male genitalia (Figs 9, 10, 15). Similar to typical *P. sappheira* and distinct from *P. nitens* in having much darker socii than *P. nitens.* In addition, the sinus is more rounded within the concavity of the sinus as is the anterior angle of the vault between the socii, which is angular in both *P. n. nitens* and *P. n. lucina.* The valvae conform to those illustrated by Sands (1980) for typical *Philiris sappheira*, but differ from *P. n. nitens*, especially in the relative thickness and shape.

Female (Figs 2, 4). Antennal shaft, head, palpus, thorax, abdomen and legs similar in colour to male. Fore wing costa basally curved, termen bowed; colour above dark grey with central area suffused blue green. Hindwing rounded, colour above grey-brown, cilia white, at ends of veins M_3, CuA_1, CuA_2. Fore and hind wing beneath similar to male. .

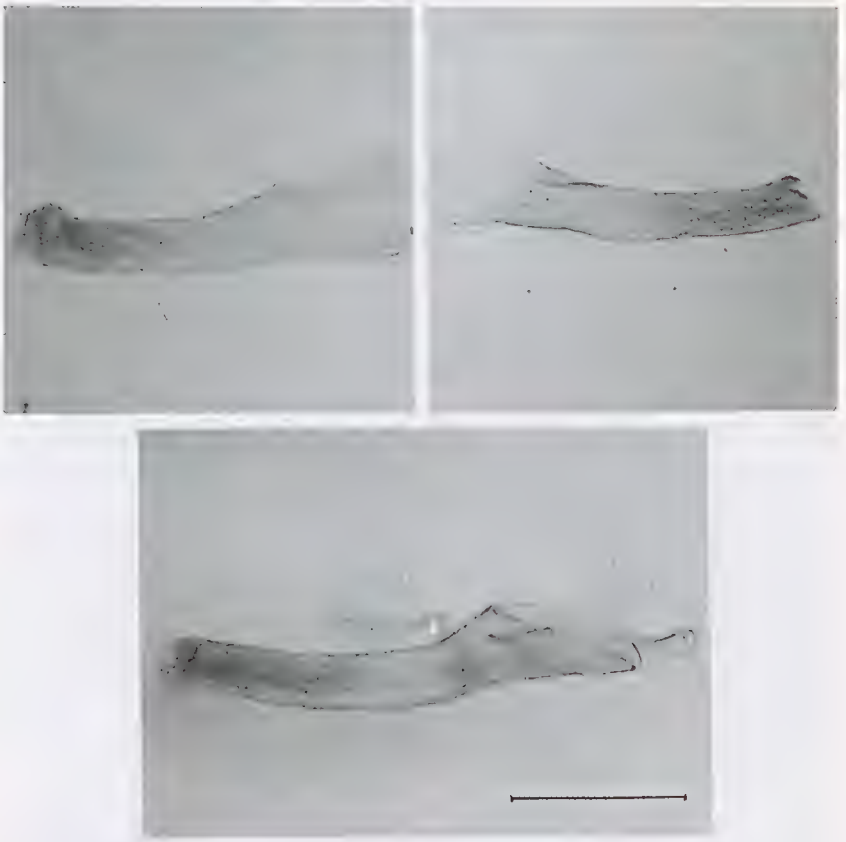
Etymology. The subspecies is named in honour of Mr R.C. Manskie of Maryborough, Qld.

Discussion

Sands (1980) synonymised *Philiris kamerungae* Waterhouse and *P. nitens restricta* Tite with *P. n. nitens* and referred to the range of variation of white suffusion on the upperside of the fore wing of both sexes. In the course of the present work, it was noted that specimens previously assigned to *P. n. restricta,* with reduced white areas, still exhibited some slight whitish suffusion on the upperside of the costa of the hind wing even on those specimens with no other white on the upper side. By contrast, of the extensive type series of *P. s. manskiei* examined, no specimen was found to have any white area on the upperside of the wings in either sex. Adults of *P. s. manskiei* were examined from every month and all were consistent in morphology with no apparent seasonal variation or polymorphism, known to occur elsewhere in the genus (Forbes 1977). Morphologically, *P. s. manskiei* differs from *P. s. sappheira* by having a larger expanse of blue colour on the hindwing of the male, whereas female *P. s. manskiei* are totally lacking any



Figs 9-14. *Philiris* spp.; male genitalia, sociuncus odd numbers, juxtae even numbers: (9,10) *Philiris sappheira manskiei*; (11,12) *Philiris nitens lucina*; (13,14) *Philiris nitens nitens*.



Figs 15-17. *Philiris* spp.; male aedeagus: (15) *Philiris sappheira manskiei*; (16) *Philiris nitens lucina*; (17) *Philiris nitens nitens*.

white colour on the upper surface of any wing other than a buff-white dorsal fold on the hindwing and consequently are very different from the nominotypical female illustrated in Sands (1980).

Common and Waterhouse (1981) recorded the distribution of *P. n. nitens* from "McIvor River, north of Cooktown, to Ingham", the McIvor River record being based on a specimen captured by Mr J.C. Le Souëf. and listed by Monteith and Hancock (1977). Examination of the specimens of *Philiris* lodged at the ANIC from the collection of the late Mr Le Souëf and scrutiny of correspondence between he and Dr Monteith from 1977 clearly indicate

that the specimen alluded to, whilst correctly identified as a female *P. n. nitens*, is labelled "Cooktown Q, 8 July 1964, J.C. Le Souëf."

The known distribution of *P. sappheira manskiei* is north and north west of Cooktown; 8 km SW of Mt Webb being the most northern record. Most specimens included in the type series were collected from relict forest referred to as "Cedar Scrub" by the Cook Shire Council and located 4 km east of the junction of Battle Camp Road and McIvor River Road (15°15'14"S, 144°59'52"E). The specimen collected by Mr J. Booy and labelled "Cooktown" (J. Booy pers. comm), plus the specimens collected by the authors and labelled "Isabella Falls", all belong to the Cedar Scrub locality. Despite frequent and extensive searching, no *P. n. nitens* or *P. s. manskiei* were located within the confines of the township of Cooktown and only *P. n. nitens* could be located on the southern side of the township, but not closer than 19 km south. Wherever the hostplant occurred on the northern side of Cooktown, the only *Philiris* found within the distribution area was *P. s. manskiei.* Thus, the known distribution of *P. n. nitens* is from 19 km S of Cooktown to Bluewater State Forest, 24 km N of Townsville.

The early stages of *P. n. nitens* are recorded by Common and Waterhouse (1981) feeding on *Glochidion philippicum* (Euphorbiaceae) but extensive breeding of this lycaenid by us has determined the primary hostplant to be *Macaranga involucrata*, the same hostplant utilised by *P. sappheira manskiei.* The early stages of these two taxa appear to be indistinguishable.

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NOTES ON THE LIFE HISTORY AND VARIATION IN ADULT FORMS OF *EUPLOEA SYLVESTER PELOR* DOUBLEDAY (LEPIDOPTERA: NYMPHALIDAE: DANAINAE)

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Abstract

Notes on the life history of *Euploea sylvester pelor* Doubleday from the Northern Territory are given and *Gymnema geminatum* R. Br. (Asclepiadaceae) recorded as a larval food plant. Adult forms collected around Darwin in 1992 are figured and variation discussed. Specimens similar to the Timorese subspecies *E. s. timora* Fruhstorfer are recorded from the Northern Territory.

Introduction

Euploea sylvester (Fabricius) is distributed widely throughout Sri Lanka, southern India, Sikkim, Nepal, southern China and the Malay Peninsula, extending throughout the islands of Indonesia and Malaysia to New Guinea, Vanuatu and New Caledonia, the Philippines, Taiwan and Australia (Ackery and Vane-Wright 1984). Three subspecies are recognised from Australia. *E. s. sylvester* (Fabricius) and *E. s. tristis* Butler occur throughout the islands of the Torres Strait (Dunn and Dunn 1991), with *E. s. sylvester* also occurring from Cape York to Rockhampton (Common and Waterhouse 1981, Dunn and Dunn 1991), westward to Fish Hole Creek, 35 km east of Karumba (Woodger 1990). *E. s. pelor* Doubleday (Figs 1-6) occurs in north western Australia from Yampi Sound, eastwards through the Northern Territory, including Darwin and as far south as Mataranka and Bessie Springs, to Gove, including McCluer Island, Oxley Island and Groote Eylandt (Common and Waterhouse 1981, Dunn and Dunn 1991).

Manski (1960) listed *Ficus glomerata* Roxb.(Moraceae) as a food plant for *E.s. sylvester*, and Common and Waterhouse (1981) noted that it had been reported feeding on *Ficus racemosa* L. Sankowsky (1991) listed *Gymnema pleiadenium* F. Muell from Forty Mile Scrub and *Gymnema geminatum* R. Br. from Chillagoe as food plants. Apart from these food plant records little else has been published on the immature stages of *E. sylvester* from Australia.

Eggs and early instar larvae of *E. s. pelor* were discovered in late December 1993 and reared on cuttings of the milkweed vine *Gymnema geminatum*, which grows along the verges of coastal or inland watercourse vine scrub in the Northern Territory.

Life history

Food plant: *Gymnema geminatum* R. Br. (Asclepiadaceae).

Egg: Pale yellow, ribbed, pointed apically; approximate size 1.5 mm high, 0.5 mm wide.

Figs 1-6. Adult forms of *Euploea sylvestor* from near Darwin. Left - figs 1-3; right - figs 4-6. (1-2), dark forms; (3), typical form; (4), transitional form; (5-6), *timora*-like form.

First instar larva: Body translucent pale orange with four pairs of very small black tubercles on segments 2, 3, 5 and 11; head black.

Final instar larva (Fig. 7): Length 38-45 mm. Four pairs of black tubercles, on segments 2, 3, 5 and 11; body translucent pale green; each segment with several white transverse bands, divided middorsally; a broken pale orange spiracular band, edged with a thin white subspiracular band; segment 1 with a pair of black subdorsal eyebrow-like marks; segments 7-10 with an indistinctive blackish smudge above the spiracular band; segment 12 with pale orange, white and black bands; head black with white markings; spiracles, legs and anal plate black.

Pupa: Translucent yellow-green at first, turning to chrome in approximately two days. Similar in shape to that of *E. core corinna* (W.S. Macleay). Size 15 mm long, 8 mm diameter.

Fig. 7. *Euploea sylvestor pelor*, final instar larva.

Observations

Eggs are laid singly on the immature new growth or on the tendrils of the vine. After hatching, larvae took on average 16 days until pupation occurred, with a further 9 days until emergence as adults. Common and Waterhouse (1981) noted that the Sri Lankan subspecies, *E. s. montana* Felder & Felder, has three pairs of tubercles on segments 2, 3 and 11. Ackery and Vane-Wright (1984) list the same tubercle formula for the southern Indian subspecies *E. s. coreta* Godart. *E. s. pelor* differs in having a fourth pair of tubercles, on segment 5.

Small numbers of newly emerged adults were found from late November to early December, with eggs and larvae generally common in late December and January. Adult numbers increase from late January through May, with late February and March being the peak flight period. As with other species of *Euploea* Fabricius in the Northern Territory, adults tend to congregate in shady areas along coastal verges or inland watercourses during the day, resting on sticks, branches or vines under the canopy.

Adult variation

Figs 1-6 are representative of the forms of *E. sylvester* collected from the Darwin coastal communities during the period February to May 1992, when the butterfly was abnormally abundant compared with previous or recent years. Adult variation generally agreed with the descriptions given in Common and Waterhouse (1981) and ranged from the dark form in Fig. 1, through the typical form in Fig. 3, to the forms in Figs 5-6, which closely resemble *E. s. timora* Fruhstorfer, figured by Ackery and Vane-Wright (1984, Plate XI, Fig. 147). D'Abrera (1990, p 184) also has a similar form figured for *E. s. timora*; however, the form figured by D'Abrera as *E. s. pelor* is the dark form shown in Fig 2. This dark form is the most common variant encountered in the Northern Territory, with a female reared from an egg. On rare occasions a transitional specimen may be encountered such as in Fig 4, which more closely resembles the nominate subspecies than the typical form of *E. s. pelor*.

Specimens of *E. s. timora* held in The Natural History Museum, London (BMNH) are all similar to Figs 5-6 (P.R. Ackery, pers. comm.), suggesting that this subspecies may be far less variable than either *E. s. sylvester* or *E. s. pelor*. Waterhouse and Lyell (1914) recorded four examples of the *timora* form (two males and two females) from the Northern Territory. To date I am only aware of a further four specimens of the *timora* form collected in the Northern Territory, with the following data: 1 male, labelled Port Darwin, F.P. Dodd, (in the Australian Museum, Sydney. Col. No. KL00718); 1 male (Fig. 5), labelled Palmers Jungle, Gunn Point, 4.v.1992, D.N. Wilson; 1 male (Fig. 6), labelled Shoal Bay, 28.ii.1992, C.E. Meyer (both in C.E. Meyer collection, Canberra); and 1 male labelled Lee Point, 20.iii.1992, R.N. Stoodley (in R.N. Stoodley collection, Darwin). Common and Waterhouse (1981) noted that occasionally the spots on the forewing of *E. s. pelor* are greatly enlarged, an observation that could have been based on Waterhouse and Lyell's records and Dodd's specimen in the Australian Museum.

This seemingly rare occurrence of the *timora* form in the Northern Territory suggests one of three possible alternatives:

(i) that the eight specimens known to date were vagrants to the Darwin region; or

(ii) that both subspecies are sympatric around the Darwin region, with *E. s. timora* being the rarer. A similar situation exists in New Caledonia with *E. tulliolus* (Fabricius) (P.R. Ackery, pers. comm.); or

(iii) that the eight specimens represent an extreme variation for *E. s. pelor* and that through continued breeding this form will be reproduced just like the darker form of Fig. 2.

Further specimens of the *timora* form are required before the relationship between *E. s. pelor* and *E. s. timora* in the Northern Territory can be conclusively determined. This may be achieved through an intensive breeding program or the discovery of resident populations of *E. s. timora*.

Acknowledgments

I thank Ian Cowie of the Darwin Herbarium, Palmerston for host plant identification, Dave Wilson of Howard Springs via Darwin and Russell Stoodley of Wagaman, Darwin for access to their specimens, Max Moulds for advice on specimens held in the Australian Museum, Sydney, Phil Ackery of the BMNH for his comments and advice regarding specimens held in their collection and Michael Braby from the ANIC, Canberra for his initial comments on the draft manuscript.

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THE LIFE HISTORY OF *BORBO IMPAR LAVINIA* (WATERHOUSE) (LEPIDOPTERA: HESPERIIDAE)

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Abstract

The immature stages of *Borbo impar lavinia* (Waterhouse) from the Northern Territory are described. *Panicum maximum* Jacq. and *Pennisetum pedicellatum* Trin. (both Poaceae) are recorded as larval food plants.

Introduction

The yellow swift *Borbo impar lavinia* (Waterhouse) is found in the Northern Territory, from Darwin east to Sixty Mile (rice project), the Adelaide River and Groote Eylandt (Common and Waterhouse 1981, Dunn and Dunn 1991). Common and Waterhouse (1981) also listed Moa Island in the Torres Strait but Lambkin and Knight (1990) suggested that this record should refer to *B. i. tetragraphus* Mabille, which is also found on Murray Island. The life history of *B. i. lavinia* is unknown in Australia.

Life History

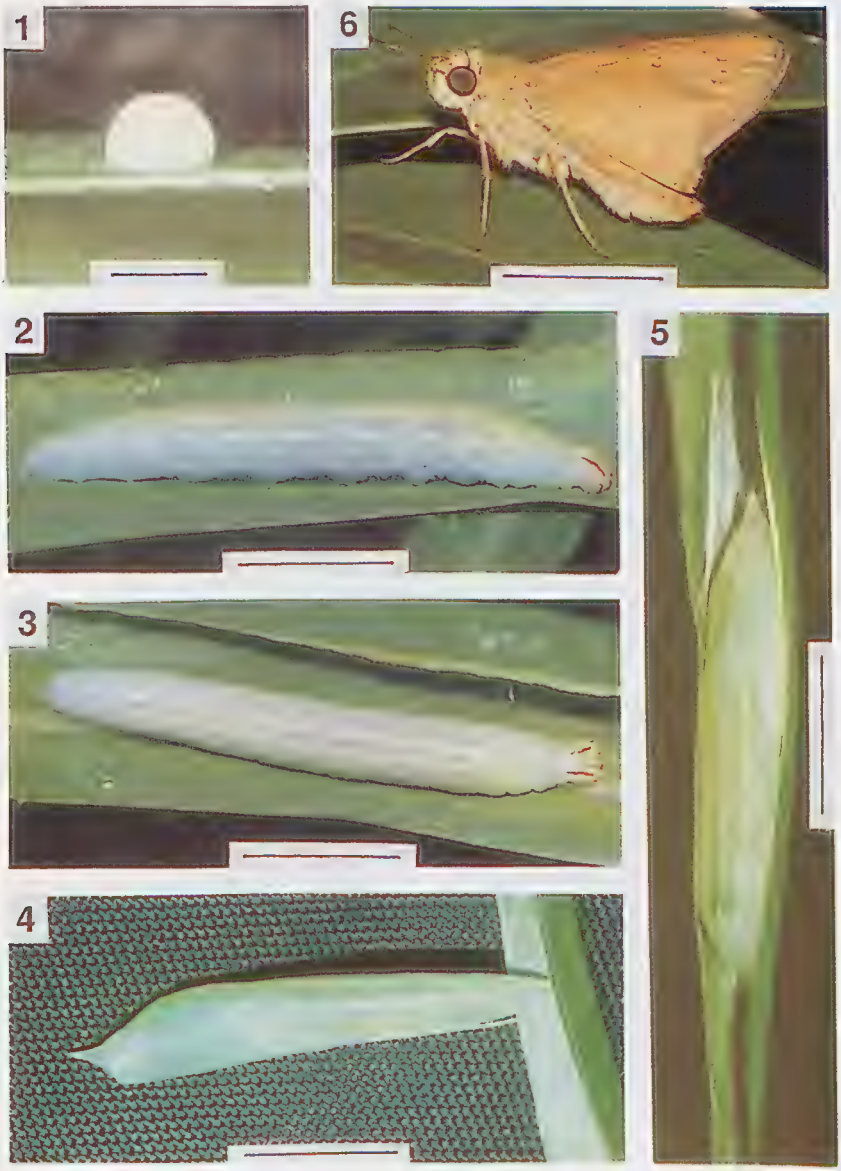
Food plants: *Panicum maximum* Jacq. and *Pennisetum pedicellatum* Trin. (Poaceae).

Egg (Fig. 1): Hemispherical, smooth and white; 1.1 mm diameter x 0.6 mm high.

First instar larva: Length 3-5 mm. Body colour pale yellowish green; head black; posterior segments flattened, slightly rounded and covered with small white hairs.

Final instar larva (Figs 2-3): Length 35-43 mm. Head beige with two distinctive tan markings surrounded by cream. Body colour cream, finely speckled all over with mint green spots. Middorsal band prominent, mint green in colour, and narrowly edged with cream. Narrow cream dorsolateral stripes also present although these are sometimes indistinct. Segment divisions are yellow, being more conspicuous around the thoracic region. The spiracles are white and the posterior segments are flattened and rounded with fine whitish hairs.

Pupa (Figs 4-5): Length 27-35 mm. Translucent green; long and slender; head with a distinct horn-like projection; darker green middorsal band sometimes evident; white subdorsal and dorsolateral lines on abdominal segments; subdorsal and dorsolateral lines sometimes present on thoracic segments; posterior end constricted to form a flattened, ventrally curved cremaster; haustellum extending to abdominal segment 7 or 8. Attached by the cremaster to a dense silken pad and supported by a silken girdle (Fig. 5).



Figs 1-6. *Borbo impar lavinia.* (1), egg; (2-3), lateral and dorsal views of mature larva; (4), lateral view of pupa; (5), dorsal view of pupa in shelter; (6), adult male. Scale bars: (1), 1 mm; (2-3), 12 mm; (4-6), 10 mm.

Discussion

Eggs were laid singly on grass blades and hatched in 5-7 days. Young larvae eat the egg shell before constructing a longitudinal tube-like shelter towards the end of the grass blade. Larvae form the shelter by rolling over one edge of the grass blade to meet the other and affixing with silk. Later instar larvae construct similar shelters further down the grass blade. Larvae rest within the shelters during the day and emerge mainly at night to feed. Younger larvae eat above and below the shelter to the midrib. Later instar larvae eat from the tip towards the base of the grass blade including the midrib and extend the shelter towards the base of the blade as the blade is consumed. Just prior to pupation larvae construct the pupal shelter (Fig. 5), which is generally located towards the end of a fresh blade of grass. To form the shelter, the larvae weaken the midrib causing the blade to fold down towards the ground. A longitudinally open tube-like shelter is formed by larvae attaching a few silken threads above and below the final resting pad and drawing the two edges of the grass blade towards each other. Larvae line the shelter with silk, orientating head upwards within the shelter and with the shelter opening facing the ground. Larvae reach maturity in approximately 21 days. Adults emerge about 16 days later.

Adult males (Fig. 6) establish territories in open sunny areas near the food plant. The females flit slowly around the food plant in shadier areas, resting frequently. Around Darwin adults fly from September to May and often occur with *Pelopidas lyelli lyelli* (Rothschild). The immature stages of *P. l. lyelli* and *Melanits leda bankia* Fabricius have also been found on both host grasses and successfully reared to adults. Mature larvae and adults of *P. l. lyelli* can be separated from those of *B. i. lavinia* by the descriptions given in Common and Waterhouse (1981).

Acknowledgments

I thank Ian Cowie of the Darwin Herbarium, Palmerston for plant identification and Richard Weir of Leanyer, Darwin for his assistance in the field and for the egg photography.

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NOTES ON THE LIFE HISTORY OF THE WESTERN AUSTRALIAN SKIPPER *MESODINA HAYI* EDWARDS & GRAHAM (LEPIDOPTERA: HESPERIIDAE)

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Abstract

The life history of the endemic Western Australian skipper *Mesodina hayi* Edwards & Graham is described, illustrated and compared to other members of the genus. The foodplant is *Patersonia drummondii* (F. Muell.) Benth. (Iridaceae). Two new localities for *M. hayi* are recorded.

Introduction

Mesodina hayi was described only recently (Edwards and Graham 1995). Larvae of other members of the genus all feed on species of *Patersonia* (Iridaceae) (Common and Waterhouse 1981, Edwards 1987). Initial searches therefore were made for suitable foodplants of *M. hayi* on Nature Reserve 16405, near Quairading, the only known locality. In October 1994 a number of mature larvae and pupae were found on *P. drummondii* plants growing in light coloured loamy sand on a well drained gentle slope. The site was dominated by *Allocasuarina campestris* shrubland with *Dryandra*, *Beaufortia* and *Verticordia* shrubs forming a component of the association. Further visits were made to the site in 1995 so that progress of oviposition sites and larval development could be documented.

Life history

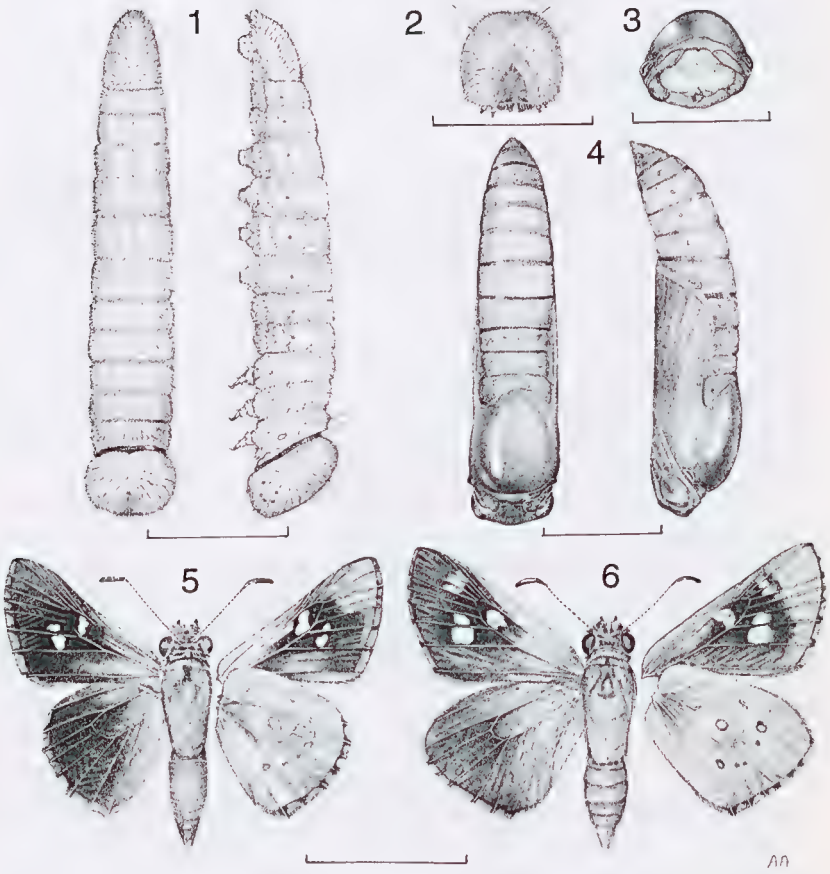
Foodplant: *Patersonia drummondii* (Drummond's Flag Lily) (Iridaceae).

Egg (Fig. 11). Diameter 1.3 mm, hemispherical, uniformly pale green in colour; surface with 68-74 fine vertical ribs, broken near micropyle. Translateral striations or cross ribs between vertical ribs very fine, more prominent on dorsal surface.

First instar larva (Fig. 12). Length 3.5-4.5 mm, head shining black, finely pitted and with sparse long whitish setae; prothoracic plate shining black with a few short setae; collar between head and prothoracic plate pale pink. Body tapered, front portion yellowish green, rear half becoming more yellowish. Body covered with a few short clubbed setae, posterior end with sparse long whitish setae.

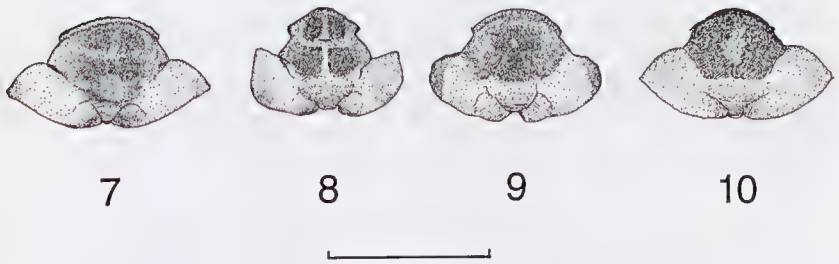
Third to final instar larvae (Fig. 1). Length 13-20 mm; head (Fig. 2) large and rounded, pale greyish green in colour, surface slightly roughened and covered with numerous long blackish setae. Each of these protrudes from a black spot which gives the head a speckled appearance. Body greenish, with sparse short club-like setae. Posterior end with long pale setae. The intersegmental membranes are yellowish and contrast with the green body colour, though in full sized larvae this contrast may be less pronounced. A

very distinct narrow black dorsal line extends almost the length of the body. The mature larva is sparsely covered with white waxy powder.

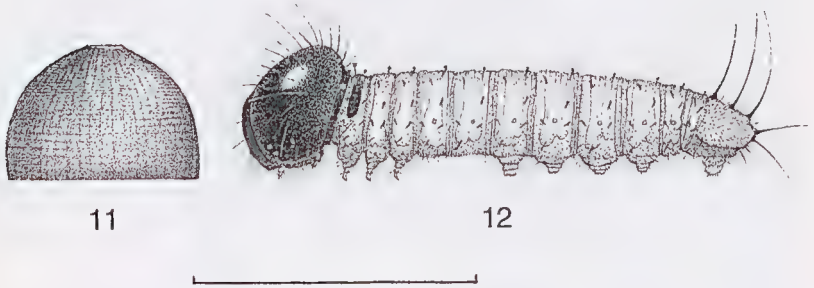


Figs 1-6. Juvenile stages and adults of *M. hayi* from Quairading, WA. (1) final instar larva, dorsal and lateral view; (2) final instar larval head; (3) frons of pupa; (4) pupa, dorsal and lateral view; (5) adult male, upperside and underside; (6) adult female, upperside and underside. Scale bars: (1-4) = 5 mm; (5, 6) = 10 mm.

Pupa (Fig. 4). Length 15-17 mm, moderately broad anterior tapering to posterior with small cremaster. Frons (Fig. 3) more or less smooth, with a small moderately sclerotized operculum. Colour somewhat variable, fresh pupae with head, thorax and wing cases dull green, abdomen yellowish. Some specimens have a blackish head and dorsal thoracic area. As pupae develop they darken; just prior to emergence the pupal cap (Fig. 8) is black, the thorax and wing cases brownish black and the abdomen dark yellowish brown. The edges of the abdominal segments remain yellowish giving it a banded appearance.



Figs 7-10. *Mesodina* pupal caps. (7) *M. cyanophracta*, Perth, WA; (8) *M. hayi*, Quairading, WA; (9) *M. halyzia*, Isla Gorge, Qld; (10) *M. aeluropis*, Blue Mts, NSW. Scale bar = 5 mm.



Figs 11-12. Juvenile stages of *M. hayi* from Quairading, WA. (11) egg; (12) first instar larva. Scale bar = 2 mm.

Discussion

There appears to be only one generation annually. At Quairading adult *M. hayi* emerge during October and November. Eggs are laid singly on the underside of the leaves of the foodplant. The emerging larvae make small shelters by silking together two adjacent leaves and start feeding at the tips of the leaves above these shelters. Larger larvae construct tent-like shelters by silking together five to eight leaves of the foodplant. These are open at the bottom and lined with silk. Though smaller in size, they are similar to shelters of *Mesodina cyanophracta* Lower which are found on the more robust *P. occidentalis* (Williams and Atkins 1996). *M. hayi* may also produce characteristic wedge-shaped feeding scars similar to those made by the larvae of *M. cyanophracta*. However, the narrow leaves of *P. drummondii* often mean that the depth of the cuts results in the upper portion of the leaf falling away leaving the leaf cut off at an oblique angle. Larvae usually return to this exposed surface on subsequent feeding forays. They often construct silken tightropes from the base of the leaves below their shelters to their feeding sites, habitually using these pathways when travelling to and from their shelters. Captive larvae have been observed feeding during the late afternoon (R.W. Hay, *pers. comm.*). They seldom feed for longer than 10 or 15 minutes before returning to their shelters. After rain, larvae have been observed imbibing moisture off the surface of the leaves. In common with other species of *Mesodina* Meyrick, larvae of *M. hayi* rest head downwards within their shelters and before pupation seal the entrance with a paper-like layer of silk.

There are marked differences between the eggs, larvae and pupae of *M. hayi* and those of *M. cyanophracta*. The eggs of *M. hayi* are uniform in colour and lack the characteristic maroon dorsal blotch found in eggs of *M. cyanophracta*. In first instar larvae of *M. hayi*, the collar between head and prothoracic plate is pale pink, whereas in *M. cyanophracta* this collar is bright orange-red. Mature larvae of *M. hayi* are greenish, similar to those of *M. halyzia* (Hewitson) (Common and Waterhouse 1981), whereas *M. cyanophracta* larvae are greyish-brown in colour (Williams and Atkins 1996). In pupae of *M. hayi*, the operculum is less ovoid with higher dorsal extension and upturned lateral (eye) sections, whereas in *M. cyanophracta* the operculum is elliptical and pointed laterally. The pupal cap of *M. hayi* also has more definite divided sclerotized areas. Figs 7-10 show differences between the pupal caps of *M. cyanophracta*, *M. hayi*, *M. halyzia* and *M. aeluropis* Meyrick.

The wing shape of *M. hayi* and pupal operculum suggest that it is structurally close to the genera *Croitana* Waterhouse and *Proeidosa* Atkins; however the adult maculation, *Patersonia* foodplant, larval and pupal characters clearly belong to *Mesodina*. Edwards and Graham (1995) also noted that the male and female genitalia have all the attributes of *Mesodina*, and none of those of *Croitana*. The operculum of this species also shows a closer affinity with *M.*

aeluropis from eastern Australia rather than *M. cyanophracta* from Western Australia.

Searches for other populations of *M. hayi* in the Western Australian wheatbelt have so far been unsuccessful. The small grey-green leafed form of *P. drummondii* has been recorded from wheatbelt sites near Quairading, Tammin, Bruce Rock and Wyalkatchem. However, it is likely that many of the localities where Herbarium material was originally collected have been cleared for farming.

To the north, two much larger forms of *P. drummondii* are known to occur (G. Keighery, *pers. comm.*). Examination of plants growing alongside the North West Coastal Highway 56 km north of the Murchison River Bridge (27°21'01"S, 114°37'26"E), and at Kalbarri National Park (27°42'59"S, 114°19'13"E) in September 1995, confirmed the presence of *M. hayi* populations at both localities. Interestingly, specimens of *M. cyanophracta* have also been taken near Kalbarri (Edwards and Graham 1995), and we found *M. cyanophracta* pupae on isolated clumps of *P. occidentalis* within 10 metres of *M. hayi* larvae on *P. drummondii*. This confirms that *M. cyanophracta* and *M. hayi* are sympatric. Further surveys are planned to establish whether *M. hayi* utilizes *P. drummondii* elsewhere.

Voucher specimens are lodged in the Insect Collection of the Western Australian Department of Conservation and Land Management and in the Andrew Atkins private collection.

Acknowledgments

We thank Michael Braby, CSIRO Division of Entomology, Canberra, for material help. Jeni Alford from the Western Australian Herbarium identified *Patersonia drummondii* specimens from Quairading. Greg Keighery of the Department of Conservation and Land Management provided valuable information on the distribution and status of *P. drummondii*.

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NEW RECORDS OF MINUTE BEES (HYMENOPTERA: COLLETIDAE: EURYGLOSSINAE)

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Abstract

New distribution records are given for *Euryglossina mellea* (Cockerell) and *E. proserpinensis* Exley, minute Australian colletid bees.

Introduction

As well as adding to our knowledge of a poorly known but significant element of the Australian fauna, bee records are useful to biologists interested in the flowering habits of native plants in different parts of Australia.

Abbreviations used are as follows: ANIC, Australian National Insect Collection, Canberra; QDPI, Queensland Department of Primary Industries, Brisbane; UQIC, University of Queensland Insect Collection, Brisbane.

New records

Euryglossina (Microdontura) mellea (Cockerell), previously known from coastal areas of south-east Queensland and central New South Wales (Exley 1968), has been collected in very large numbers in both southern and northern Queensland. Specimens in QDPI and UQIC were collected on blossoms of *Angophora costata* at Miriam Vale in October, *Eugenia eucalyptoides* and *Melaleuca argentea* at Laura in October and November and on *Callistemon* near Mareeba.

Euryglossina (Turnerella) proserpinensis Exley, a species with reduced venation (only 4 complete cells in forewing), was known previously from coastal Queensland around Bowen and Proserpine, with one record farther north at Mt Carbine (Exley 1968). New Queensland records are from blossom of *Eucalyptus* sp., collected near Cooktown in May (in UQIC). In the Northern Territory, J.C. Cardale collected specimens at Magela Creek, SSE of Mudginbarry HS in November, on flowers of *Eugenia ?blesseri*, at Nourlangie Creek, 8 km E of Mt Cahill in November, on *Eucalyptus* sp., at Nabarlek Dam, 14 km SSW of Nimbuwah Rock in November, on *Eucalyptus* sp. and near Mt Borradaile in June, on flowers of *Eucalyptus* sp. (all in ANIC). Also, four females were collected by R.I. Storey along the Arnhem Highway, 35 km W of Wildman River in November, on *Melaleuca* sp. (in QDPI).

Reference

EXLEY, E.M. 1968. Revision of the genus *Euryglossina* Cockerell (Apoidea: Colletidae). *Australian Journal of Zoology* **16:** 915-1020.

THE IDENTITY OF *AEOLOTHYNNUS* ASHMEAD AND NOTES ON *ISWAROIDES* ASHMEAD (HYMENOPTERA: TIPHIIDAE: THYNNINAE)

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Abstract

Asthenothynnus Turner is newly synonymised with *Aeolothynnus* Ashmead (not *Aeolothynnus*, Turner) and diagnoses given for *Aeolothynnus* and *Iswaroides* Ashmead (=*Aeolothynnus*, Turner). Species of *Aeolothynnus* and *Iswaroides* are listed; most are new combinations. A lectotype is designated for *Iswaroides koebelei* Ashmead.

Introduction

Ashmead (1899, 1903) revised the Thynninae (then at family rank) and, in so doing, erected several new genera including *Aeolothynnus* Ashmead and *Iswaroides* Ashmead. However, his descriptions were poor and limited to keys (without further comment, description or illustration) in which the couplets were not specific and neither adequately nor unambiguously defined genera. He considered that both genera were monotypic and made no distinction between generic and specific descriptions so that his description of *A. multiguttatus* Ashmead is also that of *Aeolothynnus* and *I. koebelei* Ashmead that of *Iswaroides*.

Because of the inadequacy of Ashmead's (1903) descriptions, these genera have been misidentified by most subsequent authors, including Turner (1910) in the last revision of the subfamily. Turner was unable to recognise either genus correctly and placed species of *Iswaroides* in *Aeolothynnus* (*sensu* Turner, not Ashmead) and species of *Aeolothynnus* (*sensu* Ashmead) in a new genus *Asthenothynnus* Turner.

Whilst *Aeolothynnus* (*sensu* Turner) was synonymised with *Iswaroides* by Given (1960) and the identity of *Aeolothynnus* Ashmead discussed, no consideration of the similarity between *Aeolothynnus* and *Asthenothynnus* was given.

Iswaroides is not similar to *Aeolothynnus* and is most readily distinguished from the latter by the presence of posterolateral spines on the fifth tergite in the male, plus the absence of a sagittal sulcus on the pronotum in the female. Some consideration of the generic relationships of *Aeolothynnus* and *Iswaroides* are given by Brown (1997 a, b).

The most recent key to genera is that of Turner (1910), although some generic names were used incorrectly. These have been changed as follows: *Aeolothynnus* synonymised with *Iswaroides* by Given (1960); *Glaphyrothynnus* Turner synonymised with *Zeleboria* Saussure by Rohwer (1910a); *Oncorhinus* Shuckard changed to *Oncorhinothynnus* by Salter (1954); *Tachynothynnus* Turner synonymised with *Guerinius* Ashmead by Rohwer (1910a); and *Zeleboria* (*sensu* Turner) renamed *Neozeleboria*

Rohwer (1910a). The synonymy of *Asthenothynnus* and *Iswaroides* are discussed further below.

Institutional abbreviations: BMNH, The Natural History Museum, London; SAM, South Australian Museum, Adelaide; USNM, United States National Museum, Washington.

Aeolothynnus Ashmead
(Figs 1-6)

Aeolothynnus Ashmead, 1903: 101; Given, 1954: 22; Given, 1960: 400. Type species *Aeolothynnus multiguttatus* Ashmead, by monotypy.

Aelothynnus Rohwer, 1910a: 348. Incorrect subsequent spelling.

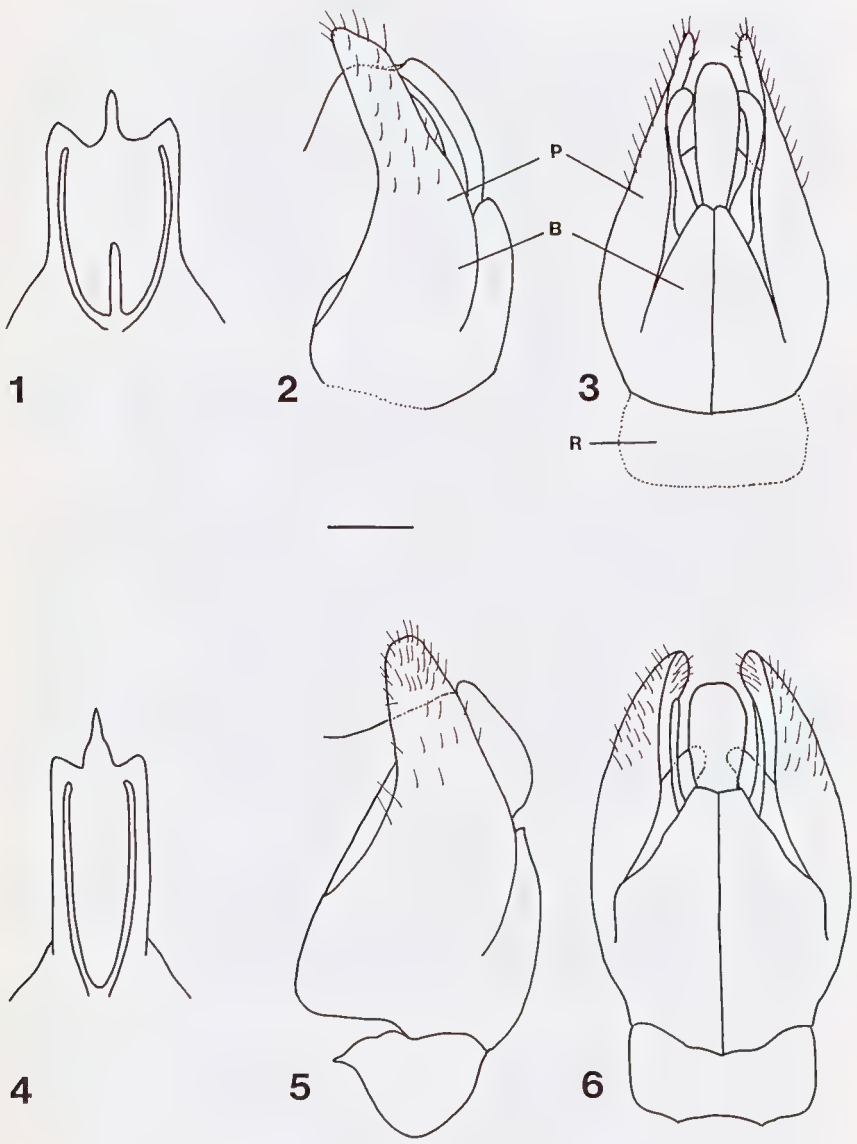
Asthenothynnus Turner, 1910: 34; Given, 1954: 27; Salter, 1954: 292. Type species *Thynnus pulchellus* Klug, by original designation. **Syn. nov.**

Material examined. Aeolothynnus multiguttatus: paralectotype ♂, Australia, Koebele (USNM) [Lectotype ♂ in USNM, here designated, same data as paralectotype; not examined]. *Thynnus pulchellus*: 1 ♂, Port Lincoln, South Australia, Lea (SAM) [identified by R.E. Turner, the type having been lost (F. Koch, pers. comm.)].

Discussion. After an examination of the paratype, Ashmead's (1903) description of the male is summarized as follows: hypopygium trispinose with middle spine slightly longer (couplets 1, 2, 3, 7, 16) and long and narrow with lateral margins subparallel (couplet 7); clypeus produced, trapezoidal with the apical margin truncate (couplet 17). This does not define the genus exclusively and at least some species of *Aspidothynnus* Turner, *Asthenothynnus*, *Doratithynnus* Turner, *Encopothynnus* Turner, *Iswaroides* and *Tmesothynnus* Turner fit this description equally well.

The hypopygium and genitalia are distinctive in the type species of *Aeolothynnus*. The hypopygium is subparallel with a relatively small apical spine and even smaller spines at the lateral angles, which are near the end of a U-shaped carina surrounding a depression on the ventral surface of the hypopygium (Figs 1, 4). The genitalia have the basiparameres large and broad and the parameres relatively short, so that the genitalia appear suborbicular. These characters also occur in the type species of *Asthenothynnus*, *Thynnus pulchellus* Klug. Although the shape of the hypopygium and the extent to which the ventral carina and depression are developed vary, I can see no morphological reason to separate these two groups and therefore consider that *Asthenothynnus* should be synonymised with *Aeolothynnus*.

The genitalia of *Aeolothynnus multiguttatus* are illustrated in Figs 2-3 (although the basal ring is hidden by the apex of the metasoma, which has been damaged; this would be more so if the genitalia were fully exposed); those of *Aeolothynnus pulchellus* in Figs 5-6.



Figs 1-6. *Aeolothynnus* spp. (1-3): *A. multiguttatus* Ashmead, male: (1) sternite 8; (2) genitalia, lateral view; (3) genitalia, dorsal view. (4-6): *A. pulchellus* Ashmead, male: (4) sternite 8; (5) genitalia, lateral view; (6) genitalia, dorsal view. Scale line = 0.2 mm. P = paramere; B = basiparamere; R = basal ring.

Diagnosis. Male: clypeus convex medially and at level of antennal prominence, not carinate; metasoma relatively smooth and polished, segments not strongly sclerotised or constricted; epipygium convex becoming membranous posteriorly, without carinae or projections; hypopygium with apex weakly concave dorsally, more or less flat apically, rounded or triangular or truncate with a small apical spine, angles of truncation may be subspinose (never spinose basally); paramere-basiparamere suture incomplete; basiparameres large and suborbicular; parameres small, often subtriangular.

Female: pronotum impunctate, sagittaly sulcate; T2 with four transverse carinae; S5 punctate; pygidium at least two times longer than wide and slightly widened towards the apex.

Included species. Twenty-seven species are included; all except *A. multiguttatus* are new combinations formerly included in *Asthenothynnus*. Previously recognised synonyms are included in brackets.

Aeolothynnus beatrix (Turner); *A. decoratus* (Smith); *A. deductor* (Turner); *A. exiguus* (Turner); *A. generosus* (Turner); *A. incensus* (Smith); *A. innocuus* (Turner); *A. kurandensis* (Turner); *A. lactarius* (Turner); *A. leucostictus* (Turner); *A. lilliputianus* (Turner); *A. maritimus* (Turner); *A. minutissimus* (Turner); *A. minutus* (Smith); *A. multiguttatus* Ashmead; *A. penetratus* (Smith); *A. perkinsi* (Turner); *A. planiventris* (Turner); *A. pleuralis* (Turner); *A. pulchellus* (Klug) (=*Thynnus multipictus* Smith); *A. pulcherrimus* (Turner); *A. pygmaeus* (Turner); *A. quadricarinatus* (Saussure); *A. rubromaculatus* (Turner); *A. tenuis* (Turner); *A. vicarius* (Turner); *A. westwoodi* (Guérin) (=*Thynnus intricatus* Smith; =*Thynnus longiceps* Smith; =*Thynnus nanus* Smith).

Iswaroides Ashmead

Iswaroides Ashmead, 1899: 50; Ashmead, 1903: 98, 104; Turner, 1910: 55; Salter, 1954: 312; Given, 1954: 42. Type species *Iswaroides koebelei* Ashmead, by original designation.

Aeolothynnus, Turner (not Ashmead), 1910: 39. Misidentification.

Turnerella Rohwer, 1910a: 349. Nom. nov. for *Aeolothynnus, sensu* Turner.

Thynnoturneria Rohwer, 1910b: 474; Salter, 1954: 297; Given, 1954: 59; Given, 1960: 402 (syn.). Type species *Thynnus (Agriomyia) cerceroides* Smith, by original designation.

Eurohweria Turner, 1911: 608. Replacement name for *Turnerella* Rohwer (preoccupied by *Turnerella* Cockerell).

Material examined. Iswaroides koebelei: lectotype ♂ [here designated], paralectotype ♀, Australia, A. Koebele (USNM). *Thynnus cerceroides*: holotype ♂, Australia (BMNH).

Diagnosis. *Male*: apex of epipygium with a single, transverse apical carina; posterolateral angles of S6 spinose and longer than those on S5 (when present).

Female: S5 punctate; mesopleura without a dorsal surface; T2 with either two or four transverse carinae; pronotum not sagittally sulcate, not medially tuberculate; pygidium long, narrow and arched at base; head constricted.

Included species. Twenty-four species are included. Although Given (1960) discussed the synonymy of *Iswaroides*, no species were formally placed in this genus other than the type species. With the exception of *I. koebelei* and *I. heinricheri*, all are new combinations formerly included in *Thynnoturneria*. *Iswaroides heinricheri*, comb. nov., was formerly included in *Thynnus*. Previously recognised synonyms are included in brackets.

Iswaroides ablatus (Turner); *I. armiger* (Turner); *I. aterrimus* (Smith); *I. baccatus* (Smith); *I. centralis* (Turner); *I. cerceroides* (Smith) (=*Thynnus perelegans* Smith); *I. compressiceps* (Turner); *I. crenulatus* (Turner); *I. decipiens* (Westwood); *I. heinricheri* (Dalla Torre) (=*Thynnus dimidiatus* Westwood*); *I. eyrensis* (Turner): *I. halophilus* (Turner); *I. illustris* (Kirby); *I. immitis* (Turner); *I. koebelei* Ashmead; *I. lachrymosus* (Turner); *I. myola* (Turner); *I. pentadontus* (Turner); *I. perturbatus* (Turner); *I. sanguinolentus* (Turner); *I. saundersi* (Turner); *I. trimaculatus* (Turner); *I. umbripennis* (Smith); *I. xerophilus* (Turner).

* The trivial name *dimidiatus* Westwood has been used for this species in catalogues by Turner (1910), Given (1954) and Salter (1954) but, under Article 59b of the International Code of Zoological Nomenclature (1985), *dimidiatus* Westwood was replaced due to secondary homonymy prior to 1961 by Dalla Torre (1897) and is therefore permanently invalid. The replacement name *heinricheri* Dalla Torre is correct.

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NEW DISTRIBUTION RECORDS FOR SOME BUTTERFLIES (LEPIDOPTERA) FROM CENTRAL WESTERN QUEENSLAND

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Abstract

New distribution records and range extensions are given for *Taractrocera ina* Waterhouse, *T anisomorpha* (Lower), *Papilio aegeus* Donovan, *Catopsilia scylla* (Linnaeus), *Delias aganippe* (Donovan), *D. argenthona* (Fabricius), *Tirumala hamata* (W.S.Macleay), *Junonia orithya* (Linnaeus), *Acraea andromacha* (Fabricius), *Jalmenus icilius* Hewitson and *Candalides heathi* (Cox) from Selwyn Mine, near Mt Isa, central western Queensland.

Introduction

The following records and range extensions from Selwyn Mine were made between October 1991 and April 1997. Selwyn Mine (21°41'S, 140°28'E) lies 140 km south east of Mount Isa, central western Queensland. Records are based on observations and collected specimens representing eleven species, two being major extensions to previous records.

Observations

HESPERIIDAE

Taractrocera ina Waterhouse. Two females were collected on 23.ii.1995 and 21.ii.1997, both flying along a creek bank beside Mount Dora, Selwyn Mine. It was not recorded from the Gulf of Carpentaria or western Queensland by Dunn & Dunn (1991) and provides a confirmed site in central western Queensland within the range indicated by Common and Waterhouse (1981).

Taractrocera anisomorpha (Lower). Seven specimens were collected in ii. & iii.1995 and two in iii.1997, all flying along a creek bank beside Mount Dora, Selwyn Mine. It was not recorded from the Gulf of Carpentaria or western Queensland by Dunn & Dunn (1991) and provides a confirmed site in central western Queensland within the range indicated by Common and Waterhouse (1981).

PAPILIONIDAE

Papilio aegeus Donovan. Five females were observed between 23.ii.-9.iii.1996, flying in a westerly direction across the Selwyn Ranges and a male was observed flying along a creek on 9.iii.1997. Alice Springs was listed by Common and Waterhouse (1981) as an isolated inland Northern Territory location but there are no previous records from the arid inland of central western Queensland.

PIERIDAE

Catopsilia scylla (Linnaeus). This species was collected or observed between i-iv.1996 and i-iv.1997. It was not recorded from the Gulf of Carpentaria or western Queensland by Dunn & Dunn (1991) and provides a

confirmed site in central western Queensland within the range indicated by Common and Waterhouse (1981).

Delias aganippe (Donovan). This species was collected or observed from v-vii. in 1993, 1994 and 1996, flying around flowers of *Corymbia terminalis,* both on the open river flats and around the upper section of trees on local hill tops. These records represent the most northern limit of *D. aganippe* in central Australia, the previous being Alice Springs (Common and Waterhouse 1981). *D. aganippe* is only occasionally encountered north of Yeppoon and records have been confined to the coastal regions and nearby tablelands (Common and Waterhouse 1981, Fox 1991, Braby 1992, 1994). This record from the poorly studied central western region of Queensland indicates that the distribution of *D. aganippe* is more widespread in the tropics than has been recognised previously.

Delias argenthona (Fabricius). Specimens were observed on 9.vii.1991 and 7.vii.1993, flying around *Eucalyptus leucophloia.* A search of mistletoe failed to locate early stages of this species. The previous most western limit recorded in Queensland is Longreach (Common and Waterhouse 1981).

NYMPHALIDAE

Tirumala hamata (W.S.Macleay). In ii. & iii.1996 and 1997, numerous specimens were observed flying in an easterly direction over the Selwyn Ranges. This locality falls within the broad distribution given in Common and Waterhouse (1981) and provides a firm record for central western Queensland. Dunn & Dunn (1991) listed vagrant specimens from as far west as Mitchell.

Junonia orithya (Linnaeus). This species was observed in iv.1991, viii.1993, vi.1995 and iv.1997. It was not recorded from the Gulf of Carpentaria or western Queensland by Dunn & Dunn (1991) and provides a confirmed site in central western Queensland within the range indicated by Common and Waterhouse (1981).

Acraea andromacha (Fabricius). Two adults were observed on 18.iii.1992 and 20.xi.1995, the latter hill-topping. Numerous additional specimens were observed from ii-xi.1996 and ii-iv.1997. Common and Waterhouse (1981) did not list it from central western Queensland, although it is known from Alice Springs, NT.

LYCAENIDAE

Jalmenus icilius Hewitson. This species was collected on 8.iv.1991 and in ii.1995 a female was observed flying around *Senna artemisioides*, upon which larvae were collected and reared. This record represents a significant range extension in Queensland of over 1000 km north from the limit shown in Common and Waterhouse (1981).

Candalides heathi (Cox). One specimen was collected in i.1996 and two in iv.1997, flying at 1.5m and landing on the tips of tall grasses along the edge of a creek beside Mount Dora, Selwyn Mine. This locality extends the range by approximately 200 km north from Boulia, the previous northern limit in central western Queensland (Common and Waterhouse 1981).

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